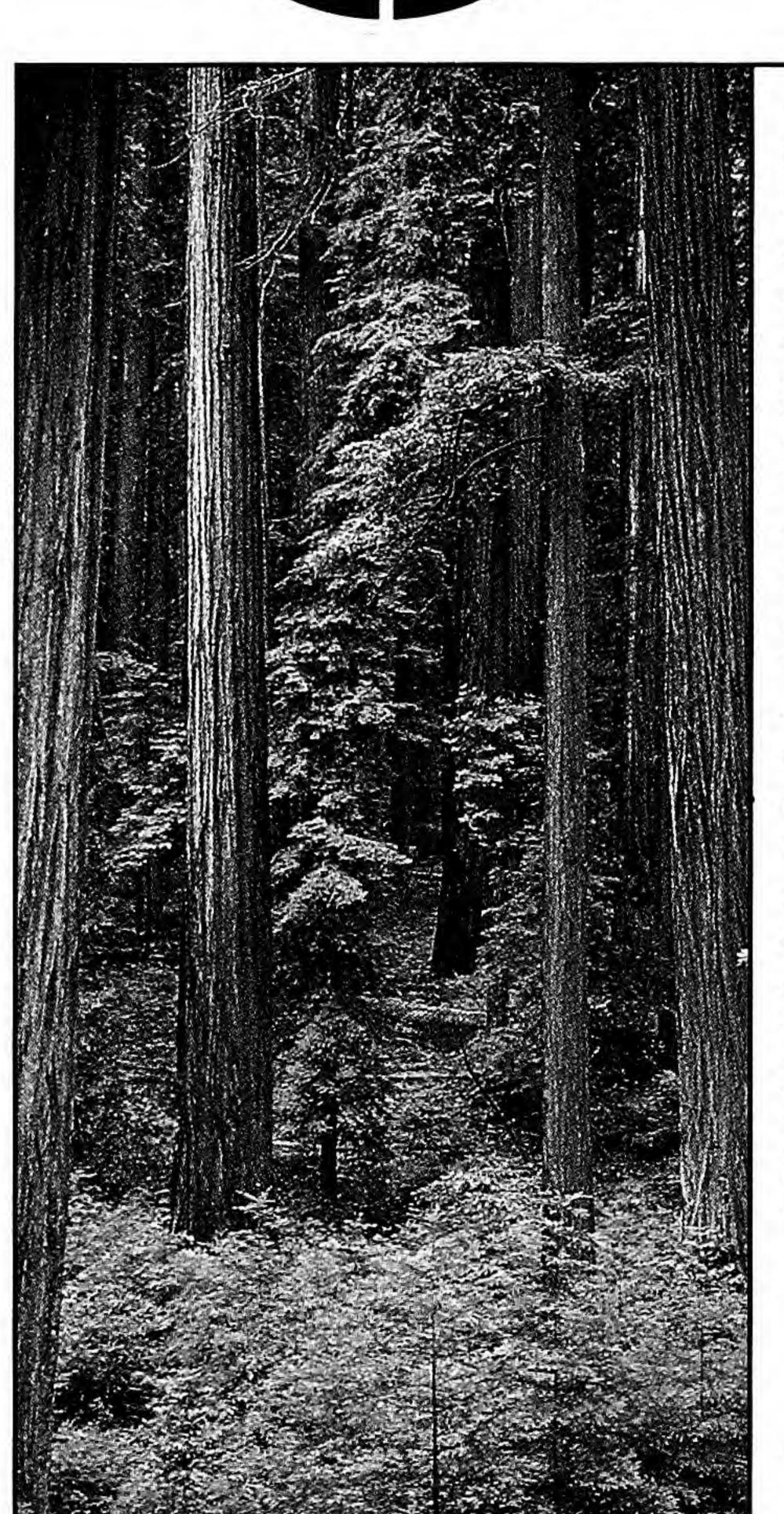


## The Flora of North America

## Research at the Missouri Botanical Garden



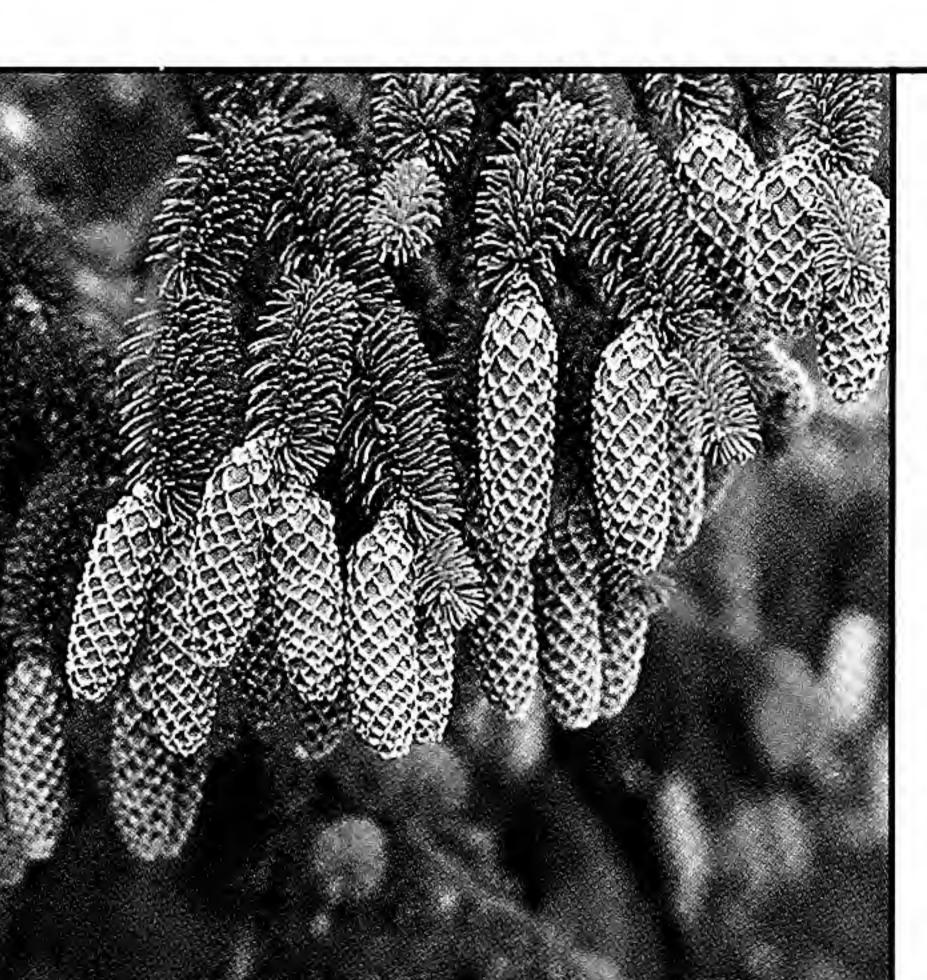


Flora of North America: The Flora of North America Project is a collaborative effort among U.S. and Canadian botanists to classify and describe the higher plants of North America north of Mexico. Sequoia sempervirens, redwood, the tallest tree—367 feet and one of the world's oldest trees, once formed vast forests across the northern hemisphere, together with its relatives the giant sequoia, Sequoiadendron giganteum—some specimens are 2500 years old—and the dawn redwood, Metasequoia glyptostroboides. Today redwood and giant sequoia are found only in a few groves on the west coast of North America, and the dawn redwood grows only in a few locations in central China. Of the 250,000 plant species in the world, 17,000 to 20,000, or about 7%, occur in North America north of Mexico. [11]

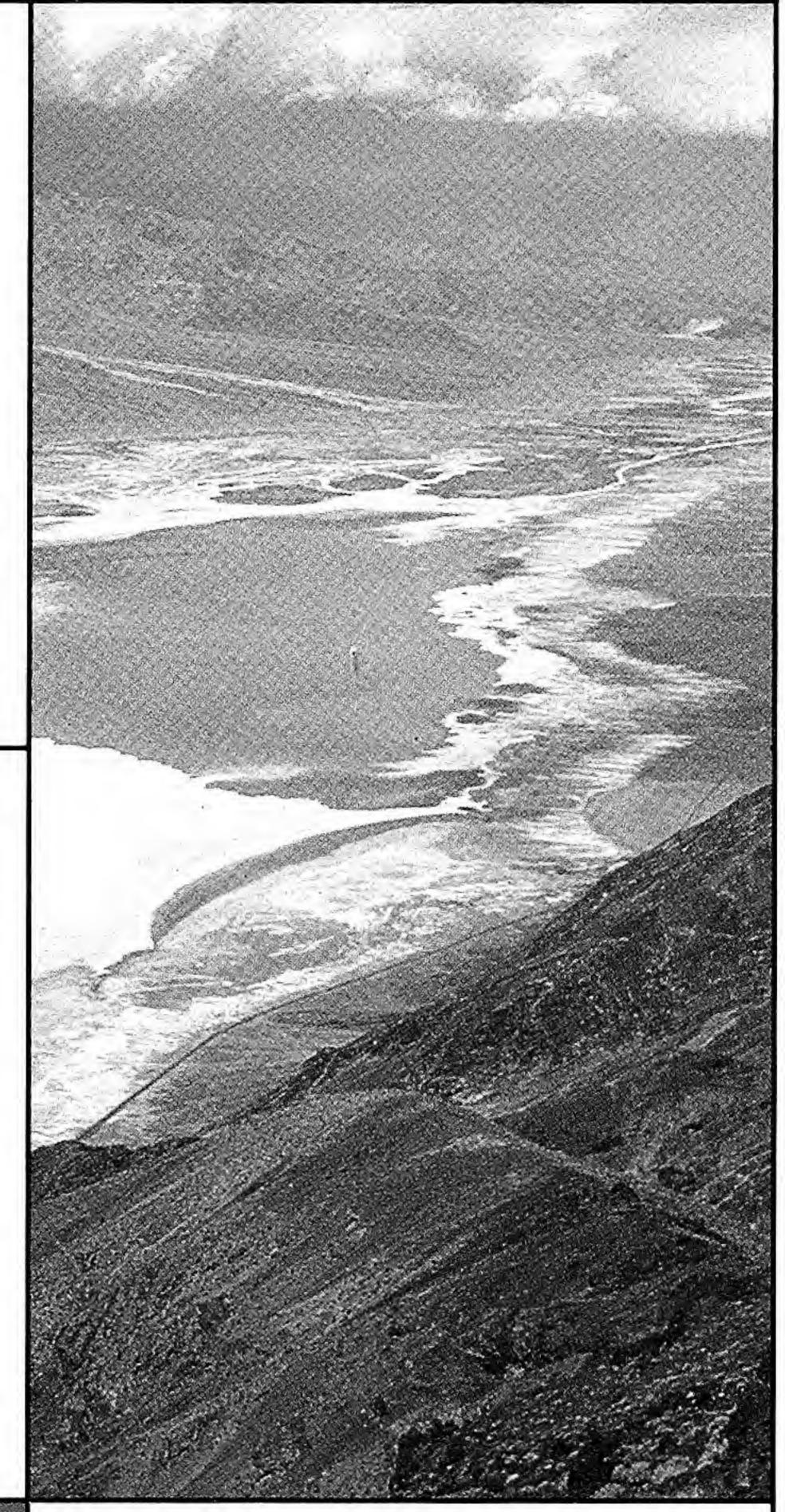


Vegetation: Coniferous forests form a continuous biome or belt across Canada and Alaska, and across Europe and Asia, extending southward in the mountain ranges. Conifers are gymnosperms—seed plants that do not have flowers. They are economically and ecologically important. The largest genera are Pinus and Juniperus. About 120 species of gymnosperms occur in North America. Pictured: Saint Pierre Island, left, and Picea sitchensis, right. [14] [15]

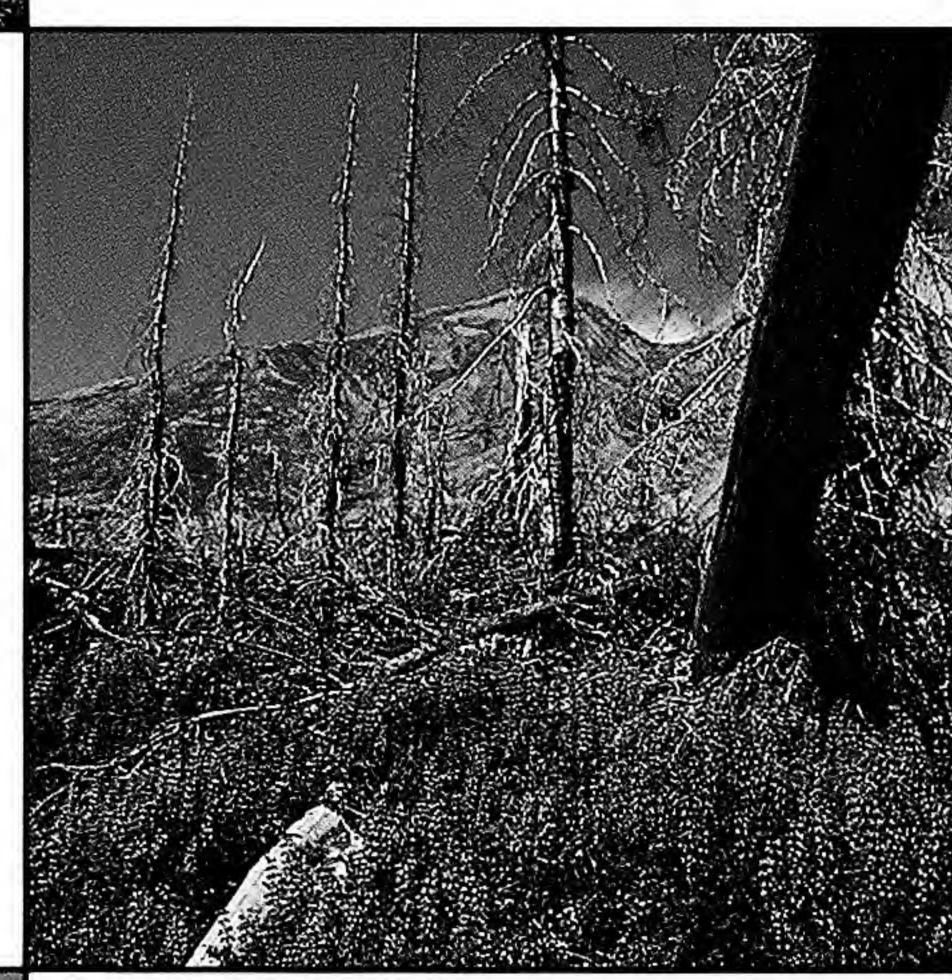
Conservation: More than one in 35 plant species in North America north of Mexico will become extinct by the year 2000, according to The Center for Plant Conservation. Pictured, left, is a Florida swamp, one of three known localities for *Campanula robinsiae*, a unique aquatic annual member of Campanulaceae, the bellflower family. *Campanula robinsiae*, thought to be extinct until two populations were found in 1982, is scientifically interesting because we don't know what it is related to or why it germinates so infrequently. Florida's wetlands harbor many rare and endangered plant species. Wetlands are important wildlife habitats. In the U.S., more than half of our original wetlands have been converted to other uses. A wetland area half the size of Rhode Island is still lost every year. Research on rare plants is urgently needed for effective conservation of their populations and habitats. [14]



Evolution: Mt. Whitney, below, is the highest point in the lower 48 states. Many alpine plants are related to species found in the "cool" deserts. Sagebrush, Artemesia tridentata, in the foreground, is one of the commonest plants in North America and typifies the vegetation of the Big Basin. Alpine conditions—low temperatures, intense solar radiation, snow, wind, and short growing season—exist in mountain ranges across North America. [11]



Adaptation—Succession: Lupinus latifolius, Fabaceae, formed dense carpets on the devastated forest floors after the volcano Mt. St. Helens, Washington State, erupted in 1980. A family of great economic importance, Fabaceae, the legume family, with more than 1200 species, is the third largest family in the FNA area. MBG is the New World Center for the International Legume Database Information System. [12]



Adaptation—Weedy habit: Fire-weed, Epilobium angustifolium,
Onagraceae, with its airborne seeds and pervasive underground stems, is a showy, post-fire, successional invader. It is able to colonize disturbed areas throughout the northern hemisphere, especially in mountains. Dr. Peter Hoch at MBG is the authority on the 35 North American Epilobium species and collaborates with colleagues worldwide in his studies. [11]

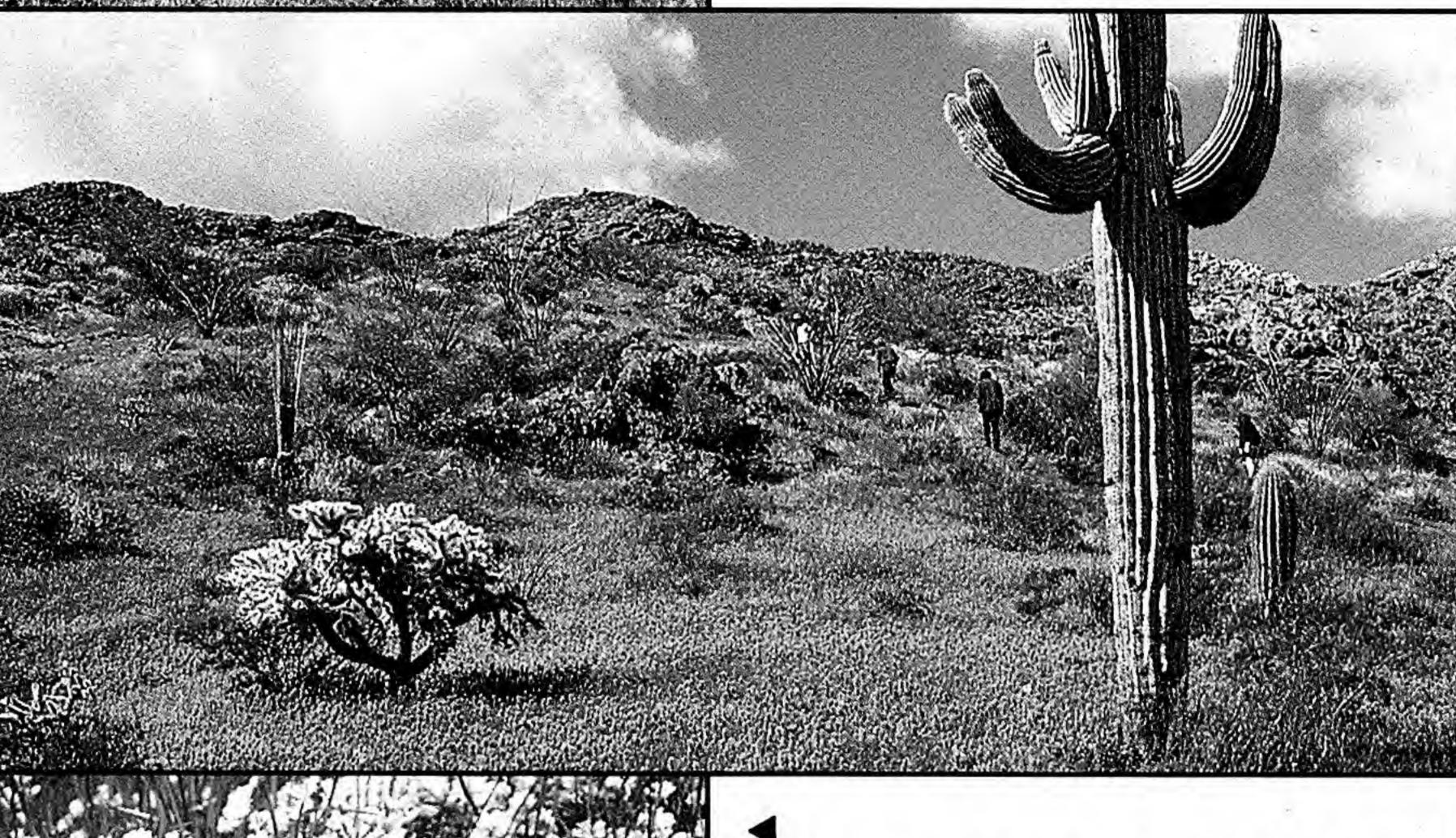
Diversity: Mt. Whitney, left, towers over Death Valley, above, the continent's lowest point, less than 80 miles away. Death Valley is a "warm desert," like the one in Arizona, below. Cactaceae, the cactus family, has one Old World and 130 New World genera. George Engelmann, the first botanist at MBG, named 100 of the 300 species and varieties of North American cacti and was first to describe the saguaro cactus, Carnegiea gigantea, below. [10] [13]



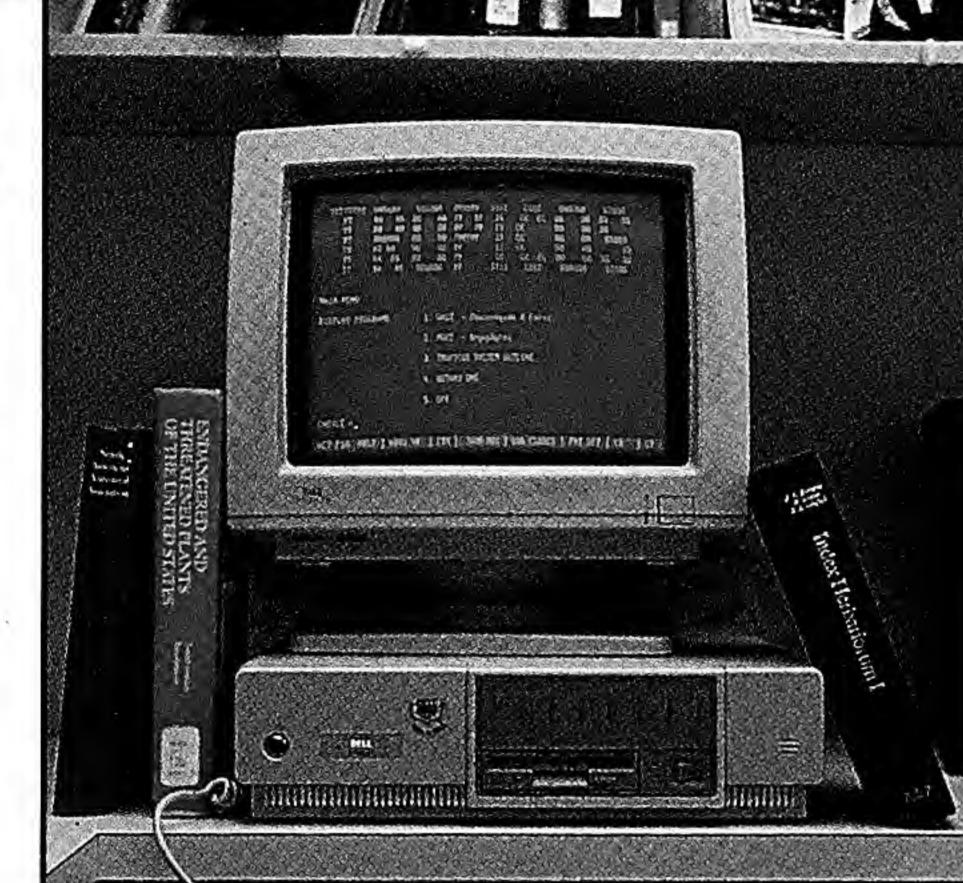
Adaptation: California's mediterranean climate of wet winters and dry summers contrasts sharply with that of the rest of the continent. The shrubby, evergreen vegetation, chaparral, left, is one of many types in North America maintained by fire. Annual plants flower and fruit quickly when water is available. Orthocarpus, owl's clover, right, an annual, forms massive displays on the California hillsides in spring. [11] [14]



Family—Onagraceae: Dr. Peter H. Raven, director of MBG, and his colleagues have studied Onagraceae, the evening primrose family, for the past 35 years. It is now one of the best known groups of plants and a powerful model for the study of plant evolution. The family has 650 species worldwide, 248 in North America. Oenothera, left, has 124 species and is a source of gammalinolenic acid, an essential fatty acid that may have important medical uses. [16]



TROPICOS: This database system, developed at MBG, is used to capture Flora of North America data. It contains information from Flora Mesoamericana and Flora of China, collaborative projects with centers at MBG. These form the nucleus of an integrated plant information system for understanding plants of the northern hemisphere. TROPICOS begins to develop a database that will help us manage our biological inheritance. [2]



Flora of North America: The books will contain geographical ranges, characteristics, and relationships of higher plants in North America north of Mexico: Canada, Greenland, Saint Pierre and Miquelon Islands, and the continental U.S.A., including Alaska. This will be the first time a full Flora treating all the species throughout their range in North America has been published. The twelve volumes will be published by Oxford University Press, one a year beginning in 1991, and will include illustrations and distribution maps. Dr. Nancy Morin, pictured right, convening editor for the project, orchestrates operations from the FNA organizational center at MBG. To serve this project, twenty-three editors work at their home institutions while hundreds of other botanists are writing and reviewing treatments of families, genera, or even individual species. The Hunt Institute for Botanical Documentation is the bibliographic center. [2]

Endemics: Limnanthaceae, the meadow foam family, contains two genera and is one of about 10 families that grow only in North America and adjacent Mexico.

Floerkea proserpinacoides, false mermaid, is the model for the FNA logo. Its showier relative, Limnanthes, meadow foam, left, has 12 species, 6 of them endangered. Limnanthes has been extensively studied genetically. Its seeds produce an oil with potential economic importance. [16]



Flora of Missouri: Steyermark's landmark Flora of 2500 species is being revised and expanded at MBG by Dr. George Yatskievych through a joint project between the Missouri Department of Conservation and MBG. Blue Spring, left, is one of many cold water springs in the Ozarks, which form a biological crossroads where boreal forest, prairie, and Appalachian floras come together. [17]



Vegetation: Prairie once covered 400,000 square miles from Canada to Texas, between the Appalachians and the Rocky Mountains, where grass grew 8 feet tall and millions of bison grazed. Less than 1% of the prairie ecosystem remains. Tallgrass prairie, left, grows on soil formed over thousands of years. These soils are nutrient rich, unlike tropical soils, which are often nutrient poor. Family: Poaceae, the grass family, is the second largest in North America, with 1500 species of the 10,000 species worldwide. Over 70% of the world's farmlands are devoted to the growing of grass seeds such as wheat, corn, and rice. Helianthus annuus, right, in the sunflower family, Asteraceae, is the only North American native grown as a crop plant. Asteraceae is the largest family in the world and in North America, where it has more than 2200 species. [1] [8]



Vegetation: The Great Smoky
Mountains, shown here in fall
splendor, are among the oldest
mountains on earth. Northern plant
species that sought refuge during the
ice age still remain on mountain slopes.
Evergreen hemlock forests grow next
to deciduous oak-hickory forests, with
rhododendrons 20 ft. tall underneath.
The Great Smoky Mountains form
one of 50 U.S. National Parks. The
first, Yellowstone, was established in 1872. [6]

Biogeography: Florida is North

America's gateway to the tropics.

Many tropical plants reach their north-

ern extent here. Ferns are especially

diverse in Florida. About 400 species

of ferns and fern allies occur in North

America. The Everglades, a



Speciation: More than 130 of the 500 species of *Viola* occur in North America, with unique species in almost every region. There are 2350 genera of plants in North America, almost 900 of which are found nowhere else. In the past fifteen years, scientists have discovered more than 725 new species, subspecies, or varieties of plants in the lower 48 states alone. Pictured: *Viola utahensis*, left, *Viola pedata*, right. [17] [5]



Horticulture: Cornus canadensis, an

understory shrub in oak-hickory for-

ests, is one of many North American

plants suitable for landscape planting.

because they are "preadapted" to

local climatic conditions and resistant

to pests. More than 115 genera of

shrubs are commonly cultivated,

North American herbaceous

perennials and 146 genera of

and many more have horticul-

tural potential. [3]

Native plants generally need less care

Vegetation: Eastern transition forests combine elements of northern coniferous forests and southern mixed deciduous woodlands. Hemlocks grow with beeches and sugar maples, left. The forest floor is covered with a rich diversity of herbaceous perennials, including orchids, such as *Cypripedium pubescens*, below. The tropical family Orchidaceae, with 20,000 species, is the second largest family in the world. The FNA area has 195 species. [3] [3]

Distribution: There are two species of tulip-tree in the world, Liriodendron tulipifera in eastern North America, right, and Liriodendron chinense in China. Many eastern North American plants have close Asian relatives. Flora of China, coordinated at MBG, is a collaborative project between U.S. and Chinese botanists to translate and revise the current Chinese Flora and will increase our understanding of such patterns of distribution. [7]

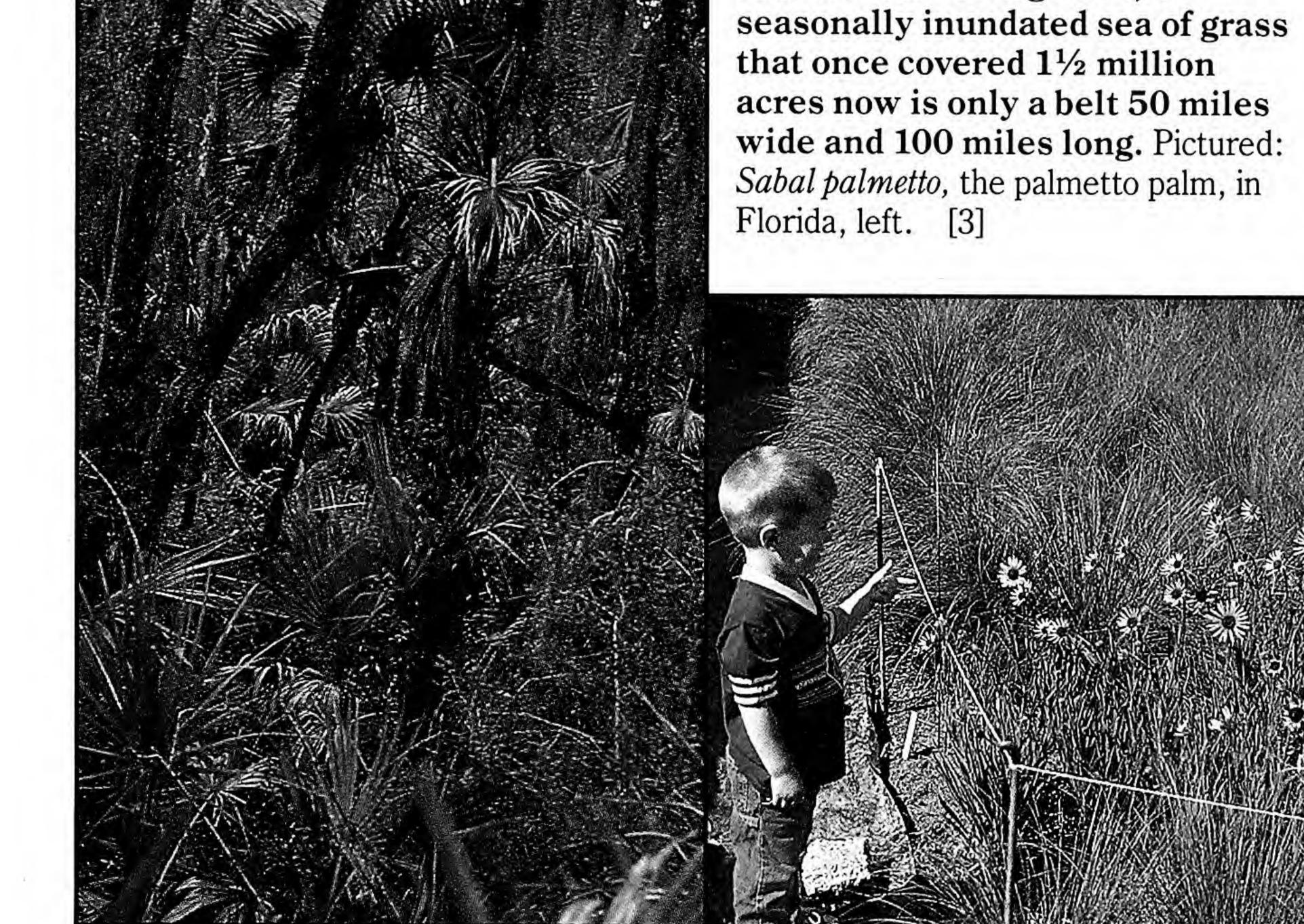


Conservation—Preserving habitats: The pitcher plant, Darlingtonia californica, left, captures insects, an adaptive strategy that increases its nitrogen and phosphorous uptake in an environment poor in these essential elements. Sarraceniaceae: Darlingtonia grows on the west coast, Sarracenia grows on the east coast, and Heliamphora grows in the Guyana Highlands in South America. Pitcher plant bogs are special habitats

with many endemic species. [16



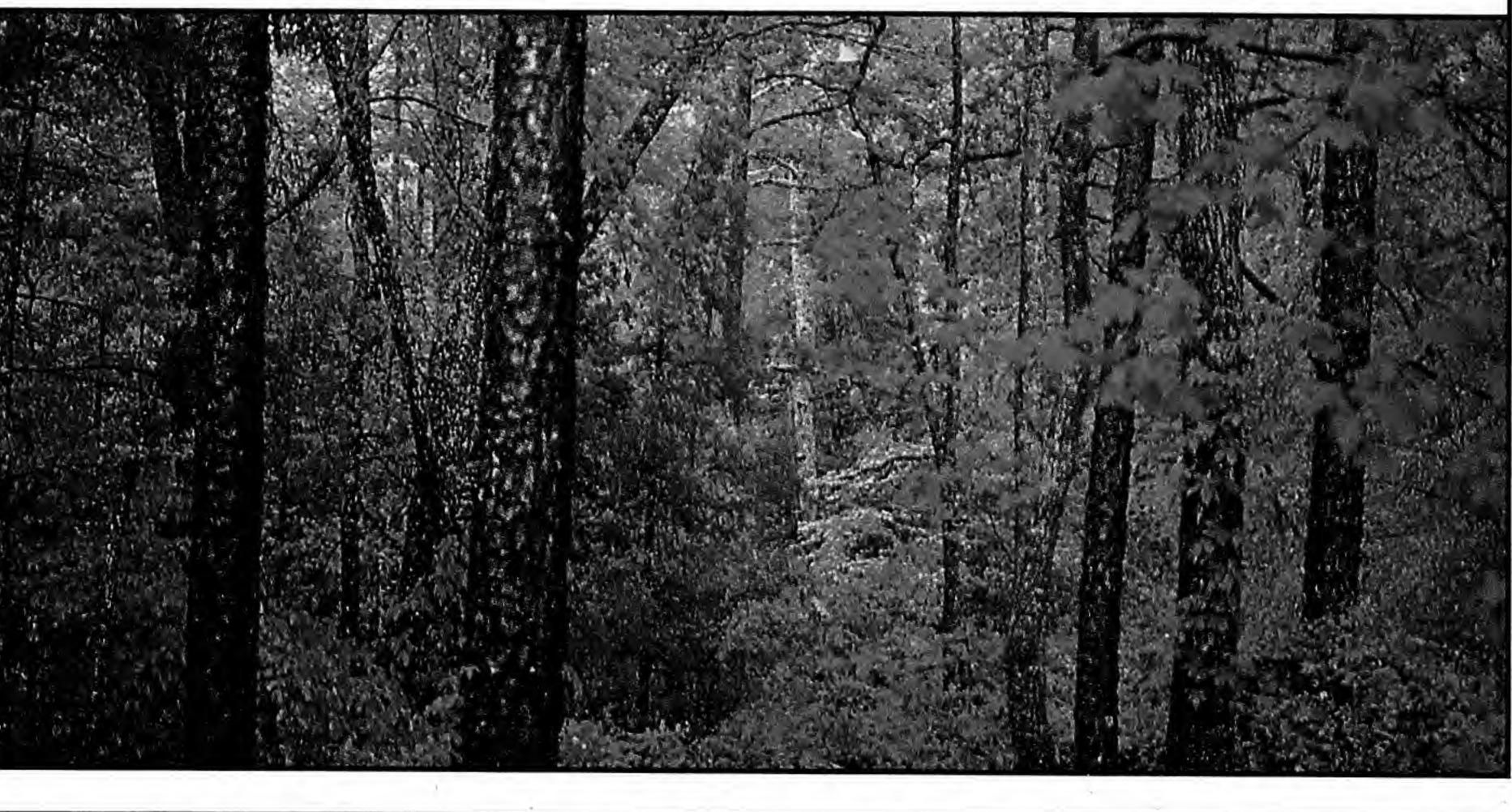
Conservation—Preserving habitats: More than 70 plant species in the New Jersey Pine Barrens are considered threatened. The Pine Barrens form a patchwork of unique habitats, including lowland bogs and dwarf pine forests. Fire maintains the vegetation here. Areas like the Pine Barrens are unique ecologically. Fragile environments with many endemic species are key focus areas for conservation. Approximately one-third of the United States, 740,000,000 acres, is owned and administered by Federal Government agencies. 5,680,000 acres have been protected by The Nature Conservancy, a private, not-for-profit organization. Many habitats and species need to be preserved before we lose them completely. TROPICOS and FNA will help identify areas that are unique and need conservation management strategies. [3]



Conservation—Preserving Populations: MBG is a member of The Center for Plant Conservation, a network of botanical institutions that preserves plants through protective cultivation in botanical gardens and arboreta. Fourteen rare plant species are grown at MBG, among them the Tennessee coneflower, Echinacea tennessensis, left, and the Kankakee mallow, Iliamna remota, right, which is among the rarest flowering plants in the country. [9] [9]



Conservation—Cooperation: Our lives depend on plants. Networks, like the Center for Plant Conservation; organizations like the Sierra Club, Audubon Society, and The Nature Conservancy; consortia of institutions, like Flora of North America, all offer ways we can join together to make the best possible use of our information and resources to protect the natural biological heritage of our continent. [7]



## Dedication

Dedicated to the collaboration process: These institutions participate in Flora of North America as editorial centers: Universities: Alaska, California at Berkeley and Davis, British Columbia, Alberta, Utah State, Wyoming, New Mexico State, Texas, Oklahoma, Kansas State, Michigan, Western Ontario, Northern Kentucky, Jacksonville Alabama State, Montreal, Harvard. And, Royal Ontario Museum, Canadian Museum of Nature, and the U.S. Office of Endangered Species.

Research at the Missouri Botanical Garden

Forty-seven Ph.D.-level scientists, twelve of whom live in tropical countries, technical staff and graduate students devote their energies to collecting and studying plants and to exploration of selected regions. These efforts are concentrated in northwestern South America, Central America, Africa and Madagascar.

The individual scientists are specialists in the plants of particular regions or in the classification of certain plant families, such as the economically important grass, legume, and nightshade families. Their research is carried out in collaboration with scientists of the countries in which they are actively working. Together they are attempting to contribute to a common knowledge of the plants that sustain us all, with a view toward conserving and properly utilizing them.

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